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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	ZUBACK, Joseph Edward
Serial No.:	10/599,350
Confirmation No.:	7252
Filed:	September 26, 2006
For:	PROCESS AND APPARATUS FOR PURIFYING WATER USING MICROFILTRATION OR ULTRAFILTRATION IN COMBINATION WITH REVERSE OSMOSIS
Examiner:	Anderson, Denise R.
Art Unit:	1797

CERTIFICATE OF TRANSMISSION UNDER 37 C.F.R. §1.8(a)

The undersigned hereby certifies that this document is being electronically filed in accordance with § 1.6(a)(4), on the 26th day of June, 2008.

/Sandra Szela Congdon/
Sandra Szela Congdon

Commissioner for Patents

DECLARATION OF JOSEPH EDWARD ZUBACK UNDER 37 C.F.R. §1.132

Sir:

I, Joseph Edward Zuback, of 172 Cottage Grove Avenue, Camarillo, California, 93012, United States of America hereby declare:

1. I am the named inventor in this pending U.S. Patent Application Serial No. 10/599,350. I have a **Bachelor of Science degree in Chemical Engineering from Purdue University**. I have worked in the water and wastewater industry for **35 years** in several research, development, and management positions, and have been named as an inventor or co-inventor on several patents, including, for example U.S. Patent Nos. 7,311,841; 5,332,388; 5,061,378; and 5,061,302. I am currently Chief Technology Officer for Siemens Water Technologies Corp.

2. I understand that in the examination of this application, the Examiner has rejected claims 1-2, 6-7, 10, 16-17, and 20 as being anticipated by the teaching of Daly, et al. in U.S. Patent No. 6,120,688 (hereinafter "Daly"), and has rejected claims 3 and 18 as being unpatentable over the teaching of Daly as applied to claims 1 and 17. Additionally, I understand that in the examination of this application, the Examiner has rejected dependent claims 4 and 5 as being unpatentable over Daly as applied to claim 1, and further in view of U.S. Patent No. 5,059,317 (hereinafter "Marius"), and dependent claims 11-15, 19, 25, and 27-34 as being unpatentable over Daly as applied to claim 1, and further in view of Water Encyclopedia (Jay Lehr, editor, John Wiley & Sons, Inc., New York, 2005) (hereinafter "Encyclopedia.")

3. I have read and understand Daly, which is directed to a method and apparatus for producing drinking water using microfiltration and reverse osmosis. My comments herein are provided to highlight the differences between Daly and the present invention.

4. Daly discloses a portable apparatus in which impure or raw water is pumped through a microfiltration unit, followed by at least one reverse osmosis unit. The retentate of the reverse osmosis unit is then stored in a clean-in-place (CIP) tank to be used during backwashing of the microfiltration unit. Prior to either processing filtrate from the microfiltration unit through the reverse osmosis unit or using the retentate stored in the CIP tank for backflushing, the fluid is passed through a ten micron filter (54). The purpose of the ten micron filter (54) of Daly is to protect the reverse osmosis membrane(s). However, the ten micron filter of Daly is unable to remove materials that can *originate* within the reverse osmosis membrane modules. This is described in more detail below.

5. Daly does not recognize the significance of materials that may be produced on the concentrated (retentate) side of the reverse osmosis unit. It appears that an assumption is being made in Daly that the feed water entering and the concentrate exiting the reverse osmosis membranes always have the same potential for fouling microfiltration membranes. That is, Daly does not recognize that particles or flocculants may form from the reverse osmosis process, particularly with regard to the concentrated retentate stream.

6. I have discovered that the reverse osmosis process will inherently concentrate colloidal and dissolved solids in the retentate, generally by a factor of two if the reverse osmosis recovery is 50%. Such concentration could cause certain dissolved solids to exceed their solubility threshold and form

precipitated solids, and/or concentrated colloidal suspended particles. These precipitated solids and/or concentrated particles would likely pass through the ten micron filter of Daly and become part of the reverse osmosis feed such that they can form discreet flocculant particles upon concentration in the reverse osmosis membranes. This concentration step performed by the reverse osmosis membrane would increase the potential for fouling of the microfiltration membrane of Daly during backwashing.

7. Additionally, it is known that reverse osmosis membranes generally have large surface areas available for supporting the growth of microoganisms. I have also found that when desalinating surface water with dissolved oxygen and dissolved biodegradable organics, the potential for such growth of microorganisms with reverse osmosis is significant. Once the reverse osmosis membranes become inoculated with bacteria, a significant bacterial colony will be established over time. As the colony grows, eventually it reaches a level where hydrodynamic forces within the reverse osmosis modules regularly cause some bacteria flocculant to slough off of the membrane and exit the module with the reverse osmosis concentrate. These bacterial flocculant particles would, in the absence of the secondary filter of the present invention, encounter the "clean side" of the microfiltration membrane during backwashing and potentially lead to premature fouling of the microfiltration membrane. The ten micron filter of Daly would not be able to filter out these bacterial flocculant particles that are smaller than ten microns.

8. Foulants generated by the two mechanisms described above that pass through the ten micron filter of Daly would likely be removed during backwashing of the microfiltration membrane and retained on the "clean" side of this membrane. This is problematic because it would slow down the flow rate through the microfiltration membrane during normal operation of the filtration unit. If the foulant particles become dislodged from the "clean" side of the microfiltration membrane, these particles may then also be reintroduced to the reverse osmosis membranes, thereby having a damaging effect on these membranes as well.

9. To summarize, the ten micron filter of Daly has no impact upon post-reverse osmosis membrane fouling potential via the above two mechanisms. In contrast, the present invention recognizes the problems associated with foulants being formed in the retentate and/or on the reverse osmosis membrane surface and addresses this issue with the use of a secondary microfiltration or ultrafiltration membrane downstream of the reverse osmosis retentate stream. This secondary microfiltration or ultrafiltration membrane filter of the present invention assures removal of formed

foulants, including those formed by or originating from the reverse osmosis unit to produce a filtered saline solution and to protect the "clean" side of the primary microfiltration or ultrafiltration membrane during backwash.

10. I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under § 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: __15 June 2008___

JE Zuback

Joseph Edward Zuback